BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

As rescanning documents *will not* correct images, please do not report the images to the Image Problem Mailbox.

PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification: Not classified	**A2**	**(11) International Publication Number:** **WO 91/09513** **(43) International Publication Date:** 11 July 1991 (11.07.91)

(21) International Application Number: PCT/US90/07476

(22) International Filing Date: 17 December 1990 (17.12.90)

(30) Priority data:
451,351 15 December 1989 (15.12.89) US

(71)(72) Applicant and Inventor: STEPHENS, Anna, Q. [US/US]; P.O. Box 13608, Salem, OR 97309 (US).

(81) Designated States: AT (European patent), AU, BE (European patent), BF (OAPI patent), BJ (OAPI patent), BR, CA, CF (OAPI patent), CG (OAPI patent), CH (European patent), CM (OAPI patent), DE (European patent), DK (European patent), ES (European patent), FR (European patent), GA (OAPI patent), GB (European patent), GR (European patent), IT (European patent), JP, KP, KR, LU (European patent), ML (OAPI patent), MR (OAPI patent), NL (European patent), NO, SE (European patent), SN (OAPI patent), SU, TD (OAPI patent), TG (OAPI patent), US.

Published
With declaration under Article 17(2)(a).
Without classification and without abstract; title not checked by the International Searching Authority.

(54) Title: THE EFFICIENT STRUCTURE

I. **INTRODUCTION AND SUMMARY:**

Logs, timbers, beams and dimensional lumber offer a special combination of structural advantages for construction including greater tensile strength, cohesiveness, resiliency, and resistant stiffness compared to other building materials, so that these materials are generally recognized to be, in most respects, the strongest building materials. These characteristics are uniquely formed by trees' special adaptive growth processes (designed by the Divine Creator with technology that is still beyond mankind's capacity), which processes systematically form and adjust wood's structure, during a long growth period, to develop exceptional capacities to withstand a fairly severe range of geophysical and environmental stresses. However, there are also structural problems inherent in these materials because wood is not a static, inert, homogeneous material, but rather an organic structure which continuingly responds and reacts to changing climatic, geophysical and other environmental phenomena. Also, as these wood materials are used in structures, becoming subject to other structural difficulties, the problems of dimensional lumber are further complicated with a varied range of interdependent or interrelated factors. Usually, a single improvement or a few narrow modifications are not enough to properly solve such complex timber/structure problems, especially if the modification('s)s' scope is limited by covering only isolated circumstances that, in most real situations, would be inadequate or oversimplified.

This patent presents a comprehensive, systematic approach toward solving various inter-reactive wood log/timber building problems and toward structurally enhancing the advantageous properties of log/timber building construction, by addressing all these intrinsic factors according to their inter-relations, in order to develop more efficient solutions.

As these problems are solved by the special features, components and elements in THE EFFICIENT STRUCTURE building system, this combination of innovative, supportive and improving elements and components facilitates more effective use of these exceptionally stress- and strain- resistant materials with their properties of resiliency, tensile strength, and cohesiveness for construction of structures that may thereby withstand moderate earthquake and other geophysical stresses, as well as structural and/or environmental stress, better than other similar structures of prior art construction.

i. PURPOSES OF THE EFFICIENT STRUCTURE

Several innovative construction features of these exterior walls are designed to function synergetically in order to:

> enhance and synergetically magnify the intrinsic properties of tensile strength and cohesive wood structure inherent in logs/timbers, by means of improved and innovative joint (interface) shapes (profiles) assisted by reinforcing fasteners, so as to make logs/timbers more effectively resistant or adaptable to the shifting, torsion and warp stresses characteristic of long-term wood seasoning, structural compression and load-transfer effects, site land settling, environmental phenomena, and of moderate earthquake events;

> minimize the tendencies of the wood in logs/timbers to check or crack from the combined effects of varying intrinsic wood expansion and contraction pressures as well as structural torsion, warp, strain and stress;

> minimize the propensity for deterioration of logs/timbers resulting from exposure to severe wet weather conditions;

> minimize the effects of seasonal or climatic factors which tend to adversely affect the materials and structure of the buildings; and

> systematically improve the buildings' structural strength, adaptability and resistance to externally derived stressful dynamic-forces by means of innovative uses of supportive, complementary and structural materials, elements and components, with effective specialized, combinative and/or interactive features.

LEXICON

abut (verb) = to border; to be contiguous; to end at or to terminate at.

adapt (verb) = to fit, make suitable, or adapt an instrument to its uses; to change so as to conform to new circumstances.

adjust (verb) = to make exact; to make correspondent to or conformable with a standard; to order or regulate in accordance with a system; to settle into a satisfactory state.

SELF-ADJUSTING JOINT-LEDGE BUTTRESSED A-SHAPE COMPONENTS

/B, /C, /F 2: (7)->e->(8) top, & (3)(a)->c->(4) bottom; e=>!=>c

2. The EFFICIENT STRUCTURE best, innovative and improved, buttressed A-Shape log/timber component, /B2, has a different and purposeful composite profile shape with several unique and important features that improve Prior Art log construction, which features solve (particularly in conjunction with other components in the EFFICIENT STRUCTURE building system) most or all persistent problems of log/timber buildings. As shown in /B, /C, /D, /F, and /G with this more complexly shaped log/timber component, 2, the two A-Shaped, a->(1)->b, g->(5)->f, joint sections, (g->(5)->f / a->(1)->b) of component /B 2, are shaped, initially, by two pairs of bevel-cuts. For all log/timber components in one building the precise angle and side dimensions of all bevel cuts may be consistently changed to a slight degree (subject to the size of the raw log) if such changes are necessary to fit special structural requirements, as long as a consistent shape related to plumbed square linearity is kept for every joint/interface on all the components for one building.

Manufacturing the Joint-Ledge Buttressed A-Shape

a. In order to accomplish such **CONSISTENCY OF PLUMB VERTICAL LINEARITY FROM EACH COMPONENT TO ALL OTHERS IN THE STRUCTURE**, all joint/interface elements should be shaped to establish a consistently precise integral structural form relative to that plumbly vertical interior facet within each component. First, each raw,

structural stability, resiliency and/or tensile strength of this building system (by synergetically contributing to a comprehensive solution of the various inter-related problems of log/timber structures) including:

A. EFFICIENT STRUCTURE LOG/TIMBER COMPONENTS

GENERAL PURPOSES AND FEATURES

/A1, /B - /G 2: a - n & (1-14), 20, 21

1. I independently claim the principal EFFICIENT STRUCTURE components, comprising log/timber-type components with innovative and purposeful composite shapes that combine several innovative features to achieve improvements over Prior Art, as these combinations comprehensively or interdependently solve several long-persisting problems of log building construction, thereby providing many unique structural advantages for the system, since these innovative and purposeful composite-shape log/timber-type components with innovative adjunctive and connective elements, functionally versatile end-joint elements and structurally purposeful profiles that resemble modified assymetrical six or eight-sided polygons, may be made from less expensive scrub or second-growth logs that are from 11 to 15 inches in diameter or from other materials adapted for special constructive purposes, (each of these two related basic shapes being individually suitable for distinct purposes) and are so shaped, as modified polygons, partly because a hexagonal or octagonal component would be more closely similar to a raw log's circular shape which presents practical

cost/benefit advantages in structural purposes and thermal energy-saving capacities by so optimizing raw log use;

1.0.1. so that, in all, these log/timber-type components' purposeful composite-shapes most efficiently

i. account for reduced waste of materials, labor and energy resources used for manufacture, assembly and finished product utility; and

ii. result in lower finished wood product unit/cost in volume, relative to some common building products (assuming good management and marketing), including standard frame construction components,

iii. yet this system's elements, components, features and functions combinatively maintain or ENHANCE these log/timber components' inherent structural advantages of superior tensility, cohesiveness and resiliancy, resulting in a better quality product with substantial innovative structural improvements over Prior Art;

1.0.2. further to the log/timber components, the following processes, features and considerations apply generally to all EFFICIENT STRUCTURE log/timber-type components:

1.0.2.1. I dependently claim inclusion of relational specifications for manufacturing methods comprising establishment of consistent vertical (and relative perpendicular horizontal) continuity between all EFFICIENT STRUCTURE log/timber components and structural elements in each building, {to differentiate from the excessively haphazard structural form common to traditional log components that sacrifice current rigorous structural requirements to accomodate rustic styling,

procedure; This improvement comprises the log/timber component's self-guiding shape that simplifies the assembly process when a log/timber for the next course to be assembled is hoisted over the top log/timber on the previously completed course in the assembled wall; Improvement occurs because as long as the new log/timber is lowered onto the top log/timber already set in the wall so that the new log/timber is somewhat centered, the moment any part of the indented slope in the lower A-shape joint element of the new log/timber comes into contact with any point on the protruding A-shape slope, on the upper joint element of the top log/timber in place on the wall, gravity will tend to slide the sloped surfaces of the new course into a stable adjuncture on the previous course atop the wall, with vertices locked together so parallel joint surfaces fit securely and closely together.

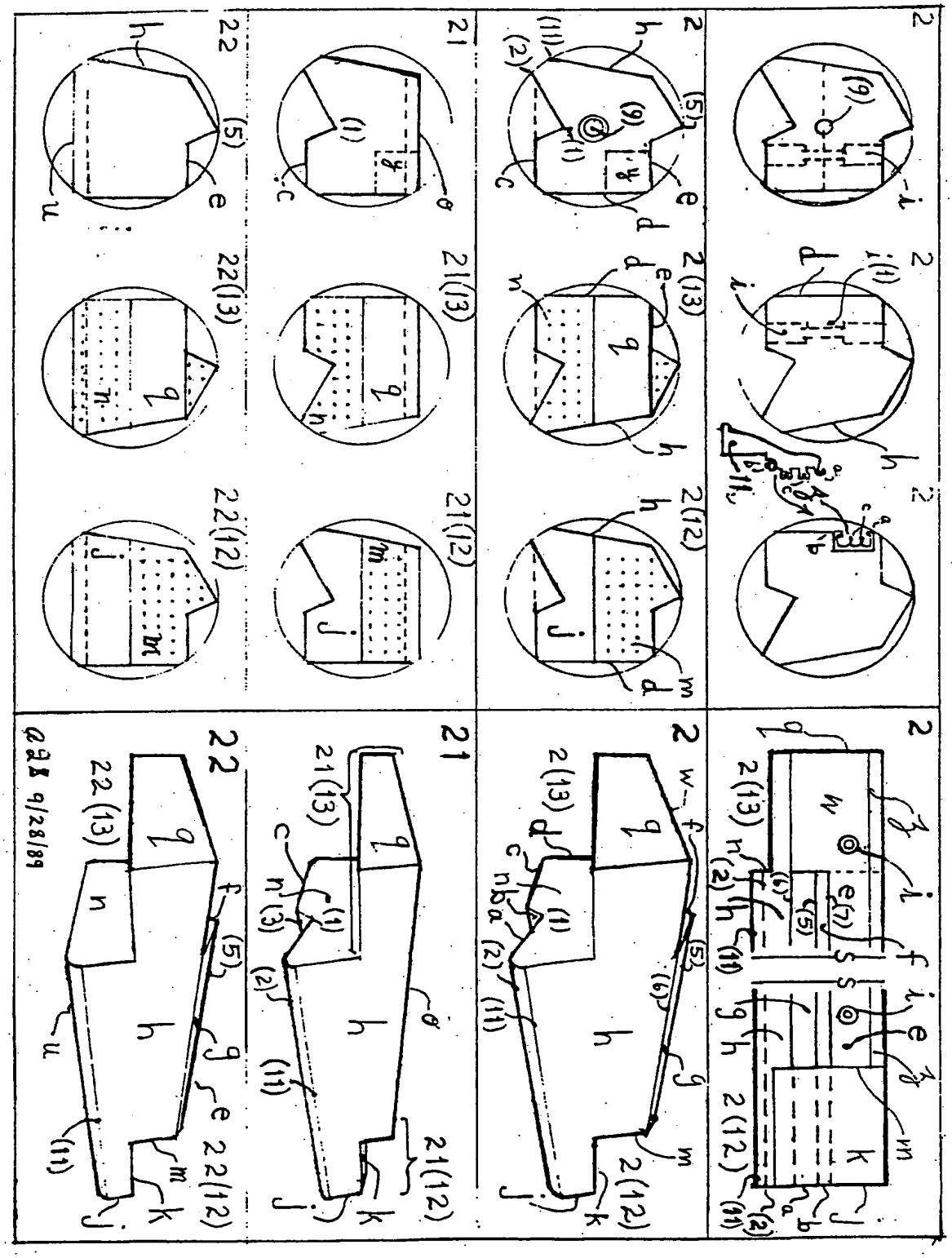
ADVANTAGES OF COMPONENTS' LAPPING ENDS

12. I claim combinative improvements for assembly and climatic protection of log/timber end seams and corners; These comprise EFFICIENT STRUCTURE log/timber component ends, right and left when viewed from the exterior face, as cut to form lap ('L' shape) joints, (including straight, inside or outside corners); These lapped joints are shaped in this form so that, as required for each structure, when each log/timber is placed into the wall, the end on one particular side (for this example the left side) of each newly hoisted log/timber would easily fit lapped OVER the preceding log's/timber's corresponding other end, that was already in place on that course (in this example the right side of the previous adjacent log/timber); Also, placement of each log/timber would thereby be

simplified consistently throughout the construction, since each log/timber is lowered by the hoist into place with a mostly vertical path, so that the fastener bolt-ends can be vertically threaded through the log/timber channels while each log/timber glides down easily into its position on the structure, as would a piece that is put into its slot in a jigsaw puzzle; This would facilitate an efficiently systematic construction sequence for all the logs/timbers in each course so that placement of each next log/timber, on the current course, proceeds in sequence in the same direction throughout construction (from left to right in this example) with improved ease of assembly.
12.1. Corners would be constructed by placing the new log/timber perpendicularly, lengthwise, to the previous adjacent log/timber, (either placed toward the inside to form an outside corner, or placed toward the outside to form an inside corner) with the left end of the new log/timber lapped perpendicularly over the right end of the previous log/timber, in a similar manner to that described above; Weather (air) infiltration and penetration of moisture into these end-joint seams is prevented by covering seams with appropriately shaped, matching-color, moisture-proof, caulked, synthetic weather shields.

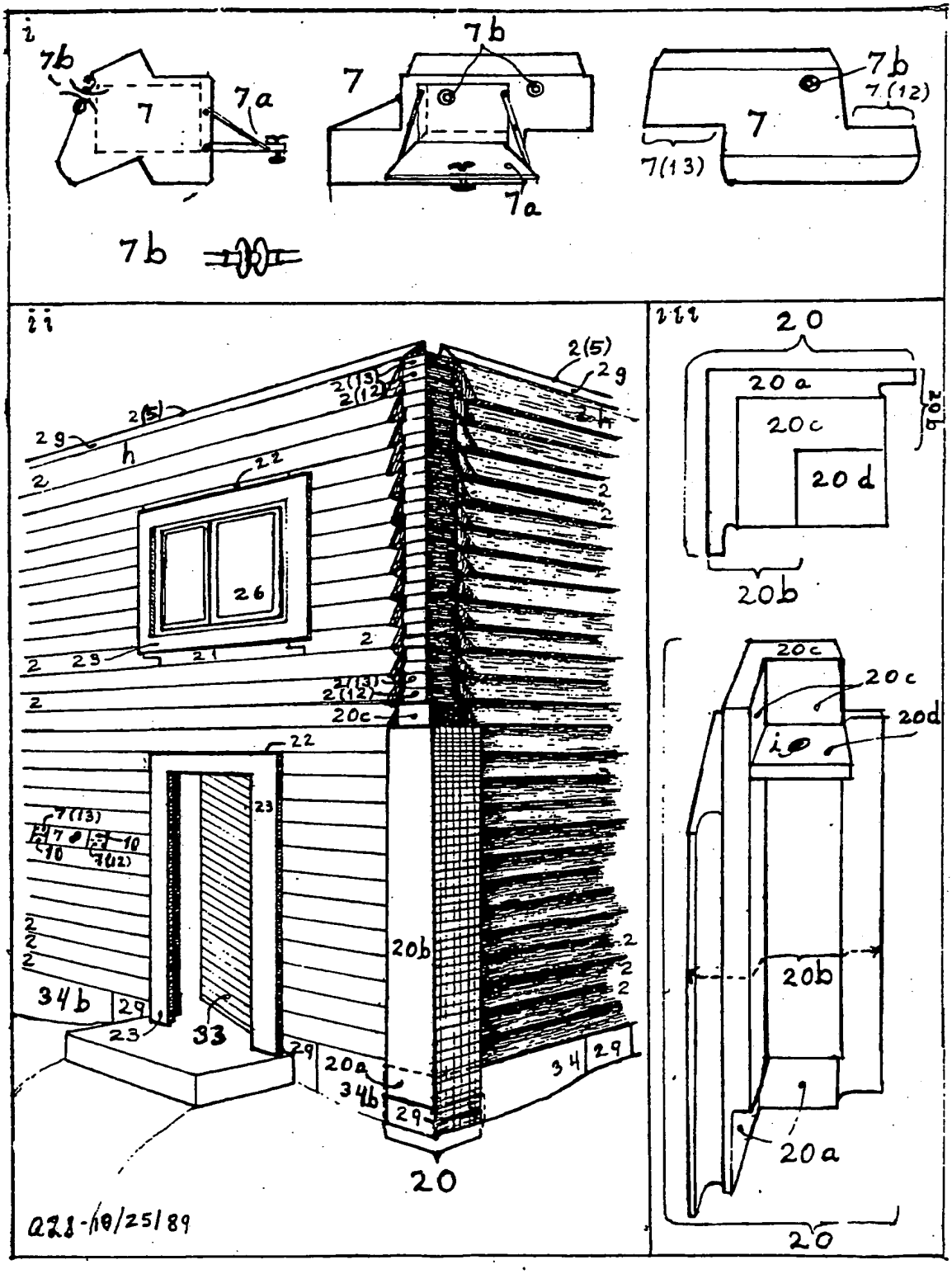
13. I claim productive and competitive advantages from improvements derived from this profile, comprising product economy without loss of advantageous structural innovations; First, product economy is improved because the octogonal shape follows but evens out the unique countours of each raw log so as to minimize wood waste;

/F Elements, Composite, Headjamb, Sill: Profile, Top, Perspective Views



9/12

/J Utility-entries & Cornerpost Shields



/MT-I-H Interface Assembly Details